specimen was taken from the lung of a consumptive patient, who died in the J. J. Hospital: similar appearances have been seen in the sputa of other phthisical patients, and they correspond to English descriptions. The *b. lepræ* I find to be usually shorter and more variable in dimensions—length $\frac{1}{2500}$ to $\frac{1}{5000}$ in.; less bent, oftener bulging in centre and thinning at the ends; oftener dotted in aspect or composed of distinct granules in linear series, the number and site of which differ considerably. The amount of small rods and signs of spore-production greatly exceed what has been seen in tuberculated tissues; yet the general characters and processes appear much alike in both sets of specimens. Other particular features are shown in the drawings, made as accurately as possible with the aid of a $\frac{1}{12}$ in. water-immersion lens, eye-piece B, and achromatic condenser of Swift.

(Signed) H. V. CARTER, M. D. (Lond.)

Bombay, November 1883.

"Further observation on the Prevention of Leprosy by segregation of the affected.

(For preceding Articles see the *Bombay Government Gazette* of 6th March 1884, Part III.)

"Having, in anticipation of the next quinquennial report, received from Bergen a short summary of the latest results of the segregation of lepers as carried out under the Norwegian Government, I think it not inopportune, with reference to recently awakened public interest concerning leprosy in India and elsewhere, to submit the following information. Dr. G. A. Hansen's position as Director of the Norse Leper Department serves for ample guarantee of the authenticity and accuracy of the statistics subjoined; and my friend of 1872 has added to his obliging communication some data of collateral interest bearing on the etiology of this national pest.

"First, as to the progressive decline of leprosy in Norway, my previous India Office Reports and the Bombay Memorandum of 1884 will be found to contain all the needful evidence establishing the fact that the total number of lepers officially registered had, between the years 1856 and 1880 inclusive, diminished from 2,863 to 1,382—see, for example, column 9 of the table given in the local Gazette. Of that later total, 617 were lodged in the Government Asylum, and 965 were living at their homes.

"The three chief asylums are recruited from the country districts under conditions already detailed; and the number of lepers they lodge at present is, I learn, 'about 500.' Owing it is understood to economic measures, the asylum population has of late years been somewhat reduced: otherwise, had the previous annual mean of about 650 (for the decennium 1871–1880) been equably maintained until now, this sum would exactly equal the total of lepers at large, as shown below; and so would have been realised the sanguine hope expressed five years ago in the words 'by the year 1885 it is anticipated that 50 per cent. or one-half the entire leper community will be isolated'—see my preceding Article, page 3, heading C, column 7. A detailed statement of the incarcerated sufferers for the quinquennium 1881–1885 is promised so soon as the official reports are complete; and since the greatest pains are taken to reach accuracy of every detail, some time longer may elapse before they are issued: meantime, the above comment may be regarded as noteworthy by way of both encouragement and warning.

"As regards 'home-dwelling' lepers—hygienically, perhaps, the more interesting important section to notice—Dr. Hansen has furnished me in advance with the ing *datum*, which concisely shows the diminution outside the asylums that has of late and is still going on, as he remarks, 'steadily and tolerably fast'.

Tabular Statement of all the Lepers known to be living at their homes, at the end of the years 1880 *and* 1885, *arranged for comparison, and according to sex.*

District of Norway.	1880.			1885.		
	Men.	Women.	Total.	Men.	Women.	Total.
Finmarken and Tromsø.	13	14	27	9	8	17
Nordland	77	48	125	61	43	104
Nordre Trondhjem	49	35	84	31	20	51
Søndre do	54	41	95	37	20	57
Romsdal	81	51	132	55	37	92
Nordre Bergenhus	115	99	214	74	67	141
Søndre do	72	86	158	49	68	117
Stavanger	48	37	85	34	22	56
Lister and Mandal	4	1	5	1	1	2
Jarlsberg and Larvik	1	...	1	...	...	...
Kristian	3	2	5	2	3	5
Hedemarken	3	3	6	1	1	2
Akerhus	...	1	1	...	1	1
Total.....	520	418	938	354	291	645
In 1885 ... { Increase ...	...	...	...	...	Nil.	...
In 1885 ... { Decrease ...	...	...	...	166	127	293
Decrease in percentages	...	...	...	31·92	30·33	31·24

"Reserving any comment on the highly localised distribution of disease as indicated above, and also on the ratio of the affected to the whole population of separate districts, I remark that this table, as it stands, shows a notable beneficial change in the amount of suffering, as evidenced by decline in number of lepers from 938 to 645—being a diminution of 293, which is equivalent to a fall of 31·24 per cent on the higher number at starting; or, in other words, at the close not far short of one-third less than at the beginning of the five years under review. And even supposing as is likely, there be hereafter found some 'overlooked' cases (see the preceding Article), still the above considerable abatement of disease within so brief a period of time cannot but be deemed both impressive and significant.

"Adverting now to the whole series of data from 1856 to 1885, it appears that the number of home-dwelling lepers in Norway has declined from 2,628 to 645, or to the extent of 75 per cent, in the course of 29 years. Again, upon closer analysis of the two tables in hand, I find that the ratios of decline at successive quinquennial periods have been as follows:—15 per cent, 13 per cent, 4 per cent, 14 per cent, 20 per cent, 31 per cent, and 31·2 per cent; so that during the last 20 years, at least, there has occurred a tolerably regular progressive improvement in the rate of abatement; and this *datum* would tend to encourage the hopes of an early practical extinction of the pest. The contrast of such a prospect as this, of the effective eradication of leprosy within the course of two or three generations, with the past experience recorded of other European countries in which the national plague persi-

with infinite aggravations for at least as many centuries, seems to me most striking. I am aware that fallacies lurk especially amongst vital statistics, but I also know that the data under review have been particularly tested; and in the small and defined kingdom to which they relate, the Government is such as to permit of a far more rigid scrutiny than usual.

"These facts, then, may speak for themselves; and as to their application, it may suffice to remind that there are in India minor provinces and even single districts, which individually could represent the kingdom of Norway as regards the amount of their leper population—this statement being based upon Indian Census returns, and from my own inquiries in Kathiawar I learnt that much less than the whole truth may so appear—*vide* Part I of former memorandum, page I.

"In such matters as this some error arises deviously through prejudice, the sick hiding their complaint, and families and communities screening their sick members; the result usually being, without doubt, a considerable distortion or else defect in formal enumerations of the afflicted. Moreover, there are direct obstacles to be encountered, if measures at all approaching to effective isolation be attempted. So has been and is now the experience in Europe—the harsh old edicts against lepers I purposely pass over—and so difficult has it proved to overcome prejudice or to interfere with the liberty of the subject, that, for example, only in June 1885 did the Norse Parliament consent to Dr. Hansen's proposal that the sanitary officials in the country districts be authorised to inform the leper subject he must take satisfactory measures against risking the infection of other people if he be allowed to live at home..... and if he will not apply such means, the sanitary authority may order him to enter an asylum..... the authorities are not compelled to do anything, but if they choose they may intervene..... As regards general sanitary measures (which the peasantry are now being instructed in), improvement must chiefly depend upon the co-operation of the people themselves..... Upon these few passages, offered as sample, I need not now venture any comment as to their applicability to India; the restrictions imposed being a sequel of prior regulations, and but part of a practical system of segregation. It may, therefore, be enough to remark that, other considerations apart, one advantage to all leper infected countries which the example of Norway by her sagacious and patriotic legislation presents, consists in their being now enabled beforehand to deliberately count the cost as compared with the benefit of similar measures, for *mutatis mutandis* there seems no valid reason to mistrust the efficacy anywhere of 'isolation,' as a principle.

"As to the *rationale* of 'segregation' or 'isolation' it is to be noted that these two methods are practically alike. There are more reasons than one that the leprous had best be kept apart. From a medical point of view, ideas have of late changed, tending now to revert to the older preference for complete isolation. Thus, at the initiation of legislative interference, the Norwegian physicians regarded leprosy as a disease kept up by hereditary transmission, and therefore recommended as sufficient the segregation of the sexes apart; whereas the present official Superintendent works with a conviction that more probably this malady is propagated by contagion, and hence he inculcates the desirability of isolating the individual of either sex. Neither of these opinions, I might add, has influenced the collection, nor need either bias the interpretation, of the statistical *data* under review.

"While it is not my intention here to discuss these fundamental topics, I may offer the following remarks as not unserviceable or out of place. According to the

---

* NOTE.—Owing to differences in the definition of 'infirmities,' the two late Census returns of the Bombay Presidency do not afford the means of estimating the advance or decline of leprosy here between the years 1872 and 1881. On the last occasion it was intended that only instances of 'black' or 'true' leprosy should be enrolled, and the total then seems to have been 10,095 (*vide* Table XVII, or 10,248 by an enumeration at page 100 of the text). The local distribution of the disease being, as usual, highly varied, there were most affected in the Deccan Division, *viz.* 5,774 lepers, of whom 4,045 were found in three of the six districts composing this division. In the text of the Census returns, no special allusion is made to the example of Norway; and the 'Pellagra' of Italy seems to be regarded as the analogue of leprosy in that country. The distinction between the two maladies is marked and was pointed out in my second India Office Report—the part published in a hand book of skin diseases for use in India.

doctrine of 'pangenesis,' heredity itself may be due to a kind of infection. The discovery by Hansen of the *bacillus lepræ* inclines strongly to the side of contagion as the effective agency, both abstractedly, and by analogy with the admittedly similar affection of tuberculosis, in which the known infective agent is a similar pathogenetic organism—see the drawing in my Bombay Memoir. At the present day, most physicians would hesitate to advance the view of a wholly spontaneous, climatic, dietetic or mal-hygienic origin of tubercular disease; and such a view of the origin of leprosy might, on the same grounds also be questioned. A *hiatus*, however, exists here; for whilst the contagiousness of tubercle (suspected in the human subject) can be demonstrated by experiment on the lower animals, no such proof as regards leprosy has yet been certainly attained. Dr. Hansen, indeed, writes that he has seen specimens of this disease derived from inoculated rabbits, and that he has the subject now under confirmation. He remarks it appears of great importance that the material employed in experiment should be perfectly fresh—the vitality of the bacilli seems to be less in old leprous nodules; and, besides, a period of several months must elapse before the results of inoculation can be surely verified. The milder form (so called 'anæsthetic' or nerve leprosy) presents the characteristic organisms; and as regards the severer 'nodular' form, Dr. Hansen finds these bacilli in wandering cells amidst the epidermic scales surrounding the true leprous ulcer; they are always present in the skin there. The internal organs of the frame may also be the seat of these organisms.

"There is, I may further observe, a third form of disease strongly resembling the leprous, which like the latter is peculiar to man, and which has already been made the subject of special legislation, being now regarded as truly contagious at all its stages. Yet I note as regards its later manifestations, which alone are those comparable to the eruptions of leprosy, it is within the memory of living medical men that non-contagion was not only asserted, but held to be proved by direct experiment. Considering, therefore, the medical history of tuberculosis and of syphilis, in connection with what modern research has revealed of leprosy, there would *a priori* seem, despite many plausible negative objections, ample grounds for suspecting the [illegible] under notice of being transmissible as are the two others. Deliberate experiment on man (the surest test) being impossible, valid evidence must be sought for comparatively, or else less directly through instances of naturally acquired disease. As yet, comparative experiments have proved dubiously; but with respect to the seemingly direct communication of disease to healthy persons living in intimate and prolonged contact with the affected, several such affirmative instances are known; one of the latest, and perhaps clearest, being that of Father Damien at the Sandwich Islands. *

"Finally, that the view of the direct communicability of leprosy is at least a good working-hypothesis, may be admitted upon considering the results of the strict segregation of the affected, as set forth in the new Norwegian statistics; for, except upon such view, no adequate explanation appears of that prompt and decided abatement of disease which these careful data show.

(Signed) H. V. CARTER."

* NOTE.—And what shall be said of instances like one coming to light whilst these lines were penned:—A married woman with children, native of Teheran, after residing three years in Bombay (Fort), two years ago went to Europe on a visit to her friends (family all healthy, developed there severe and typical disease during the winter season, was not benefited by treatment, and was urged to return to India for the sake of milder climate; arrived here in a pitiable state only a few days since, and now has no near resort but the ward shed attached to a Native General Hospital. For leprosy amongst Europeans contracted in India, see some remarks at the close of Second India Office Report, 1876.